DRAFT PRELIMINARY ASSESSMENT REPORT

Site Name:	Bremerton Gasworks
EPA ID Number:	WAN001002907
Location:	Township 24 North, Range 1 East, Section 14
Latitude:	47° 34' 40.782" North
Longitude:	122° 38' 32.224 West
Address:	1725 Pennsylvania Avenue
City:	Bremerton
County:	Kitsap
State:	Washington
Prepared for:	Joanne LaBaw, Task Monitor, EPA, Seattle, Washington
Date:	November 2010

Site Description:

The site is located at 1725 Pennsylvania Avenue, approximately 1 mile north by northwest of downtown Bremerton (Figure 1). The Bremerton Gasworks site is located on two adjacent properties covering approximately 3.68 acres in the city of Bremerton, Kitsap County, Washington. Two properties are owned by McConkey and the other is owned by Sesko. The site is composed of tax parcel numbers 3711-000-001-0409 and 3711-00-001-0607 (McConkey parcels) and tax parcel number 3711-000-022-0101 (Sesko parcel; TechLaw 2006a, 2006b).

The site is situated in mixed use commercial, industrial, and residential areas. It is bordered by the Washington Narrows waterway to the north, South McConkey Industrial Park to the south, Thompson Avenue to the west, and Pennsylvania Avenue to the east (Figure 2).

The site was originally developed by the Western Gas and Utilities Corporation to provide the City of Bremerton with light, heat, and electricity by natural gas products. The gasification plant was in operation from approximately 1930 to 1956. The plant was fueled by shipments of coal delivered by boat. The gasification process may have started by processing the coal with high temperature and pressure, using boiler plant steam and measured amounts of oxygen. The final product (coal or natural gas) was sent by pipeline to local residences in Bremerton. This site also was utilized for petroleum storage and distribution from approximately 1963 to 1985. Petroleum products were stored in aboveground storage tanks (ASTs) and distributed by underground pipeline or offloaded to vehicles. Available records are not clear regarding whether the underground fuel distribution lines were removed, if the distribution lines remain underground, or if product remains in the lines. Aerial photographs suggest that the former gasification physical plant, boiler, and ASTs were removed between 1985 and 1993 (TechLaw 2006).

The McConkey properties cover approximately 3.13 acres (TechLaw 2006). These properties are operated by Trip McConkey as a mixed use commercial property and storage rental business (E & E 2009). They currently contain five separate buildings, which are leased to a metal fabrication shop, piston ring shop, granite countertop workshop, and a welding shop (TechLaw 2006). Past commercial uses include sheet metal fabrication, drum storage facilities, automotive and marine repair, metal salvage yard, painting/sandblasting activities, and petroleum bulk storage and distribution.

The Sesko property covers approximately 0.55 acres (TechLaw 2006). This property is owned by Natasha Sesko. The Sesko property was formerly utilized as a commercial AST and petroleum distribution facility (TechLaw 2006). It is currently vacant but appears to be used as temporary storage for heavy equipment. The only structures on this property are the former foundations of the AST farm (TechLaw 2006).

A bulk petroleum storage facility (ARCO, now owned by BP West Coast Products LLC) was previously located northwest of the McConkey properties. Currently, SC Fuels, a petroleum bulk storage facility, is located east of the Sesko property and Pennsylvania Avenue (Figure 2). Historical files for the SC Fuels facility indicate that petroleum releases have occurred (Ecology 2009).

Previous Investigations:

In October 2006, the City of Bremerton received a Brownfields Assessment grant from United States Environmental Protection Agency (EPA) Region 10. This grant awarded $200,000 for additional site assessment work. The City of Bremerton had proposed to redevelop a portion of the Bremerton Gasworks site as a public access marina. The work was completed in November 2006 as discussed below.

In November 2006, Phase I Environmental Site Assessments were prepared for the McConkey Properties and the Sesko Property by TechLaw for the EPA. The objectives of these investigations were to gather readily ascertainable information regarding current and historical activities at the site and at adjacent properties then to evaluate whether known or suspected environmental concerns related to hazardous substances or petroleum products exist in association with the site or adjoining properties. Based on the investigations, it was concluded that possible polycyclic aromatic hydrocarbon (PAH) contamination and metals contamination could be present in the subsurface soil, sediments, and/or ground water at both the McConkey and Sesko properties. (TechLaw 2006a, 2006b).

The City of Bremerton contracted Geoengineers, Inc., to conduct subsurface soil sampling and monitoring well (MW) installation at eight locations. MW-1 through MW-8 were installed on May 21 through May 24, 2007. The soil borings and

MWs were advanced to depths ranging from 20 to 45 feet below ground surface (bgs). Soil samples were collected from the surface, at 5-foot intervals for each borehole. The samples were field screened for physical evidence of contamination and, based on visual observation, a minimum of two samples per borehole were submitted for laboratory analysis to TestAmerica Laboratories of Bothell, Washington. Samples were analyzed for total petroleum hydrocarbons (TPH) as gasoline, TPH as diesel, TPH as heavy oils, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), PAHs, polychlorinated biphenyls, and Target Analyte List (TAL) metals. Groundwater was encountered at depths ranging from 15 to 35 feet bgs, utilizing low flow sampling techniques.

In May 2008, Ecology and Environment, Inc. (E & E) conducted a Targeted Brownfields Assessment (TBA) for EPA. The objectives of this investigation were to present the results of limited sampling for preliminary site characterization and potential cleanup options. During the investigation, a total of seven boreholes were drilled on the McConkey and Sesko properties. MWs were installed in two of the boreholes. Additionally, four of the existing MWs were sampled. Finally, five sediment samples were collected from the Washington Narrows beach during an extreme low tide event. Sample locations are presented on Figure 3 (E & E 2009).

The samples were analyzed for TPH as gasoline (method NWTPH-Gx), TPH as diesel (method NWTPH-Dx), TAL metals [EPA contract laboratory program (CLP) statement of work (SOW) method ILM05.4), VOCs (EPA CLP SOW SOM01.2), and SVOCs (EPA CLP SOW SOM01.2).

Both the Model Toxics Control Act screening levels (Ecology 2008) and EPA Risk Based Regional Screening Levels (RSLs) (EPA 2009) were used to evaluate soil results for the TBA as conservative screening levels to assess whether contaminant concentrations pose a potential threat to human health and the environment under a variety of exposure conditions. RSLs were used preferentially for evaluation purposes to allow for maximum beneficial use of the site. Additionally, the EPA RSLs and Federal Maximum Contaminant levels were used to evaluate the groundwater encountered at the site. Finally, the newly promulgated Washington State Department of Ecology (Ecology) Marine Sediment Management Standards were used to evaluate sediment samples collected from the Washington Narrows.

SVOCs, TAL metals, TPHs, and VOCs were present at various locations around the site at concentrations above the screening criteria. VOC and SVOC contamination appeared to decrease with depth at all borehole locations; however, a horizontally-oriented, spatial pattern of contamination could not be discerned. Analytical results of the on-site ground water samples indicated that soil contamination has migrated to ground water. Sample results indicated that

SVOC, TPH-diesel, and VOC contamination is present in shallow ground water at the water table above their screening criteria. Finally, analytical results of the sediment samples collected on the Washington Narrows indicated the presence of SVOCs at concentrations that exceeded their screening criteria. Based on these analytical results, it appeared that contamination from previous operations at the site had migrated to the sediments and, potentially, the surface water in Washington Narrows. (E & E 2009).

The TBA contained cleanup options and estimated costs for three remediation options. The first option included removal of approximately 600 cubic yards of contaminated soil and installation of four monitoring wells to gather additional ground water contamination data. The second option included action to be taken under Option 1, plus installation of a ground water pump and treat system. The third option included remediation Options 1 and 2, plus installation of an upland barrier wall to stop the migration of on-site contamination to Washington Narrows, installation of an upland asphalt soil cap, and dredging of contaminated sediments on Washington Narrows. (E & E 2009).

Current Investigations:

The Kitsap County Health District investigated reports of sheen on the Washington Narrows Beach between August 20, 2010 and October 4, 2010. During the investigation, a buried concrete pipe was discovered. On September 24, 2010, one sample was collected and submitted to the Manchester Environmental Laboratory for hydrocarbon identification analysis using a method "consistent with a modified EPA SW-846 Method 8015B." The lab report does not indicate the matrix of the sample. The analytical results are reported as "this sample contains a significant amount of coal tar creosote." The pipe appeared to be leaking a black creosote-like material onto the beach. Upon discovery of the leak, the EPA was contacted. (EPA 2010)

EPA and the United States Coast Guard (USCG) visited the site on October 5, 2010 and deployed a boom in the waters of Washington Narrows to contain the release. On October 9, 2010, EPA deployed the Superfund Technical Assessment and Response Team (START) Emergency Response Team to conduct an emergency response and removal assessment of the release. START also was tasked with collecting sediment samples from the beach adjacent to the Sesko property. Sheen was noted along the beach near the pipe and at the sample locations. A total of 35 sediment samples were collected from the beach. The location of the pipeline and the sample locations are presented on Figure 4. The excavation area depicted on this figure is where the USCG contractor dug around the buried pipe to attempt to determine the extent of the pipe. Samples were submitted to an off-site fixed laboratory for VOC and SVOC analysis. Validated data results are not yet available for these samples. A pipe test showed that half of the pipe was filled with product and half was filled with sediment.

Source Characteristics:
The sources at the site include contaminated soil and the buried pipe on the Washington Narrows beach.

Because no background samples were collected for any of the investigations, it will be assumed that all detections of organic compounds in on-site soil samples are representative of contamination and are significant relative to expected background concentrations. For the sediment samples collected during the TBA from the Washington Narrows, the northern-most sample is selected as a representative background sample for the purposes of this Preliminary Assessment as it was the sample with the least amount of detected organic compounds. For the purposes on this Preliminary Assessment, analytes in sediment samples are considered elevated if they are three times the corresponding background concentration. If the analyte was not detected (i.e., undetected) in the background sample, then the analyte was considered elevated if it was simply present at a concentration above the background sample's detection limit.

Soil sample results from onsite boreholes indicate the presence of acenaphthene, acenaphthylene, acetone, anthracene, benzo(a)anthracene, benzene, benzo(a)pyrene, benzo(g,h,i)perylene, benzo(k)fluoranthene, benzo(k)fluoranthene, bis(2-ethylhexyl)phthalate, carbazole, chrysene, dibenz(a,h)anthracene, dibenzofurans, ethylbenzene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, pyrene, toluene, trichlorofluoromethane, and xylene were detected at significant concentrations. To determine the area of contamination for the contaminated soil, the boreholes (all five at the site from the TBA sampling event) with significant concentrations of contaminants were connected and the area was measured. This area measured 26,937.74 square feet. There is no evidence of a liner, maintained engineered cover, functioning and maintained run-on control system and runoff management system, functioning leachate collection and removal system, or ground water monitoring system associated with this source.

During an investigation by the Kitsap County Health District of a sheen and odor, a buried concrete pipe was discovered. Sample results indicated the pipe was discharging a significant amount of coal tar creosote. The pipe is currently leaking this material into the sediments on the Washington Narrows Beach. An observed release by direct observation is documented for this source. The hazardous waste quantity of the source is greater than 0 but unknown. There is no evidence of a liner, maintained engineered cover, functioning and maintained run-on control system and runoff management system, functioning leachate collection and removal system, or ground water monitoring system associated with this source.

Ground Water Migration Pathway:

The target distance limit (TDL) for the ground water migration pathway is a 4-mile radius that extends from the sources at the site. Figure 5 depicts the ground water 4-mile TDL.

Ground water sample results from onsite boreholes indicate the presence of elevated concentrations of acenaphthene, acenaphthylene, acetone, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, benzo(f)fluoranthene, bis(2-ethylhexyl)phthalate, carbazole, chrysene, dibenz(a,h)anthracene, dibenzofurans, ethylbenzene fluorene, indeno(1,2,3-cd)pyrene, phenanthrene, pyrene, toluene, and xylene. These contaminants were likewise detected in soils onsite.

The aquifer system at the site is the Puget Sound Lowland aquifer. In the Puget Sound Lowland, the unconsolidated-deposit aquifers consist chiefly of glacial deposits. Sand and gravel that were deposited during the last period of glaciation compose the most productive aquifers in the lowland and generally form the upper 200 to 300 feet of the unconsolidated deposits. At depth, sand and gravel deposits typically are discontinuous lenses that can be present as much as 2,000 feet bgs. Although usually much less permeable at depth because of compaction, lenses of sand and gravel can yield large volumes of water to wells. (Whitehead 1994)

The surficial geology of the Puget Sound Lowland consists mainly of Pleistocene glacial, alluvial, and marine sediments; little bedrock is exposed. Major Quaternary stratigraphic units exposed in coastal bluffs overlooking Puget Sound include non-glacial sand, silt, and clay, which are overlain by a sequence of glacial deposits, primarily the Vashon Drift. The basal member of the Vashon Drift is a widespread deposit of dense glacial clay and silt, called the Lawton Clay Member. A deposit of sand, known as the Esperance Sand Member, overlies the Lawton Clay. The basal contact of the sand is transitional over a few tens of meters, where layers of sand and clay interfinger; within this transition zone, individual strata are laterally discontinuous. The Esperance Sand becomes pebbly near the top and grades into the Vashon Drift advance outwash. The Vashon Till, which is generally compact and hard, overlies the advance outwash or the Esperance Sand. (Baum 1998)

Approximately 3,695 people use groundwater for drinking water purposes within the 4-mile TDL. A combination of Group A and Group B community water systems; and domestic wells are present. The Washington Administrative Code (WAC) defines the group designation for community water systems. The definitions as provided by the Washington state Department of Health (DOH) are:

Group A: (WAC 246-290) Group A water systems are those with fifteen or more service connections, regardless of the number of people; or systems serving an average of 25 or more people per day for 60 or more days within a calendar year, regardless of the number of service connections. Group A water systems do not include systems serving fewer than 15 single-family residences, regardless of the number of people.
Group B: (WAC 246-291) Group B water systems serve less than 15 residential connections and less than 25 people per day; or 25 or more people per day fewer than 60 days per year. Group B water systems are those public water systems that do not meet the definition of a Group A water system.

DOH maintains records of all active public water systems. Public water systems, regardless of group designation, indicate the total number of wells in the system, number of connections, and total population served. A search of the DOH Sentry Internet database revealed the presence of two Group A community wells (Minterbrook and Harbor Heights water systems) serving a total population of 3,592 people and one Group B community well (Johnson Water System) serving a total population of six people (DOH 2010). The Minterbrook water system includes a total of 16 wells, two of which are used for emergency purpose. These wells are regularly maintained for use in emergency situations. No well in the system contributes more than 40% of the total supply; therefore, each well is apportioned equally (e.g., 3,407 people/16 wells = 213 people per well). Of these wells, one is located within ¼ to ½ mile, six within 1 to 2 miles, seven within 2 to 3 miles, and two within 3 to 4 miles. The Harbor Heights water system is composed of three wells and serves a total population of 185 people. All of the wells are permanent. No one wells contributes more than 40% of the total supply; therefore each well is apportioned equally (e.g., 185 people/3 wells = 62 people per well). All three of the wells are located within 3 to 4 miles of the site. Finally, The Johnson Water System consist of one well that serves a population of six people. This well is located 1 to 2 miles from the site.

Domestic drinking water well logs are maintained by Ecology. A search of the Ecology well log database revealed the presence of 37 domestic wells within the 4-mile TDL. Domestic wells do not record the actual number of people served by each well; therefore, each well is assigned the average number of people per household for Kitsap County of 2.60 for a total population served by domestic wells of 107 people (DOC 2001; Ecology 2010). The number of drinking water wells and their associated populations are presented in Table 1. Population figures in this table were rounded to the nearest whole integer for reporting purposes.

Table 1 Ground Water Drinking Water Population by Distance Ring

Distance Ring	Number of Wells	Well Population	Total Population for Distance Ring
0 to ¼ mile	None	0	0
¼ to ½ mile	Community A – 1	213	215.6
	Domestic – 1	2.6	
½ to 1 mile	Domestic – 1	2.6	2.6
1 to 2 miles	Community A – 6	1,278	1,286.6
	Community B – 1	6	
	Domestic – 1	2.6	
2 to 3 miles	Community A – 7	1,491	1,517
	Domestic – 10	26	
3 to 4 miles	Community A – 5	611	673.4
	Domestic – 24	62.4	
Total			**3,695.2**

Groundwater is not used within the 4-mile TDL for irrigation of five or more acres for commercial food crops or commercial forage crops, watering of commercial livestock, as an ingredient in commercial food preparation, as a supply for commercial aquaculture, or as a supply for a major or designated water recreation area.

A designated Wellhead Protection Area is within the TDL.

Surface Water Migration Pathway:

The surface water migration pathway TDL begins at the probable point of entry (PPE) of surface water runoff from the site to a surface water body and extends downstream for 15 miles. The 15-mile TDL is depicted in Figure 6.

There is no distinct runoff route from the land surface at the site to the Washington Narrows. Sheet flow from the site is anticipated to flow overland down the banks into the Washington Narrows. For this reason, the shoreline of Washington Narrows at the site is considered to be a PPE for surface water runoff to the surface water migration pathway. Additionally, the pipe which is discharging material on the Washington Narrows Beach is considered a PPE.

The average annual precipitation for Bremerton, Washington is 45.11 inches (WRCC 2010). The site is not located within a flood plain (FEMA 2007).

Soils at the site are characterized as Dystric Xerorthents (45 to 70% slopes) and Alderwood very gravelly sandy loam (0 to 6% slopes). The Dystric Xerothents are deep, moderately well-drained to somewhat excessively drained soils on the sidewalls of river valleys and sidewalls of entrenched streams. They are formed mostly of glacial till, but some are formed in sandy and gravelly outwash. Also

present at the site is Alderwood very gravelly sandy loam (0 to 6% slopes). The soils are moderately deep, moderately well-drained. They are formed in glacial till. Permeability is moderately rapid above hardpan and very slow in hardpan. (USDA 1980)

There are no drinking water intakes within the TDL because the water is saline and there are no desalinization plants present on Puget Sound. Puget Sound, including Washington Narrows, is a major water recreation area.

Sport fish catch data in Washington State is reported by statistical area. Portions of statistical Area 10 are within the TDL. Approximately 75% of Statistical Area 10 is within the TDL (for all species other than Steelhead). The statistical area for steelhead is reported as Area 11: Mid-Puget Sound, of which it is estimated that 75% is within the TDL. Sport catch data is presented by number of fish caught. To determine the amount of fish in pounds, the average weight of each type of fish was multiplied by the total number of fish. The most recent report for sport harvest is 2003 to 2004. Sport catch data is presented in Table 2.

Table 2 Sport Catch Fish Harvest

Species	Number Harvested	Average Weight per Fish	Pounds Harvested
Chinook salmon	4,660 x 75% = 3,495	22	76,890
Coho salmon	10,286 x 75%=7,714.5	10	77,415
Pink salmon	1,064 x 75% = 798	10	7,980
Sockeye salmon	3 x 75% = 2.25	5	11.25
Chum salmon	528 x 75% = 396	8	3,168
Steelhead	5 x 75% = 3.75	7.5	28.13
Flatfish (except halibut)	19,798 x 75% = 14,848.5	2 [a]	29,697
Rockfishes	1,462 x 75% = 1,096.5	2 [a]	2,193
Pacific Cod	3 x 75% = 2.25	4	9
Surfperches	2,133 x 75% = 1,599.75	1	1,599.75
Sculpins	18 x 75% = 13.5	1	13.5
Spiny dogfish	735 x 75% = 551.25	1 [b]	551.25
Miscellaneous bottomfish	5 x 75% = 3.75	2 [a]	7.5
Total			**199,563.38**

Source: WDFW 2010, Wydoski and Whitney 2003)

Key:
a = The starry flounder was used for average weight.
b = Because this was a mixture of fish species, a conservative weight of 2 pounds was estimated for all types of bottom fishes and spiny dogfish.

Commercial treaty and non-treaty harvest data is recorded by the Washington State Department of Fish and Wildlife. Commercial catch data is reported in pounds by statistical area. The most recent year for which commercial data is available is 2009. The statistical areas that are present within the TDL include area 10 – Seattle, 42K – Port Orchard, 26B – Seattle-Port Madison, 26C – Port Orchard, and 42A – Bremerton. It is estimated that 75% of these statistical areas are within the TDL. Commercial fish catch data by species is presented in Table 3.

Table 3 Commercial Treaty and Non-Treaty Fish and Shellfish Harvest

Species	Total Pounds of Fish	Pounds Harvested within the TDL (pounds x 75%)
Atlantic Salmon Aquaculture	12,367,744	9,275,808
Chinook salmon	21	15.75
Chum salmon	735,732	551,799
Coho salmon	1,879	1,409.25
Pink salmon	347,410	260,557.5
Silver smelt	3,513	2,634.75
Steelhead	7	5.25
Dungeness crab	89,399	67,049.25
Geoduc clams	869,580	652,185
Horse clams	1	0.75
Manila clams	97,435	73,076.25
Native Littleneck clams	1,454	1,090.5
Pacific oyster	4,565	3,423.75
Sea cucumber	21,962	16,471.5
Spots shrimp	9,629	7,221.75
Total		**10,912,748.25**

Source: Turcotte 2010

Puget Sound within the TDL provides critical habitat for the Federal-listed threatened Puget Sound Chinook Salmon Evolutionarily Significant Unit (ESU; DOC 2005). The Federal-listed threatened Puget Sound ESU Steelhead is known to be present within Puget Sound and therefore, within the TDL (Maguire 2010). Finally, 3.45 miles of wetland frontage are present on Puget Sound within the TDL.

A zone of actual contamination is present along the Washington Narrows Beach where sediment samples were collected during the TBA demonstrated contamination and where the concrete pipe is discharging creosote to the beach. The sediment samples indicated the presence of elevated concentrations of acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, benzo(f)fluoranthene, carbazole, chrysene, dibenz(a,h)anthracene, dibenzofurans, ehtylbenzene fluorene,

indeno(1,2,3-cd)pyrene, phenanthrene, pyrene, toluene, and xylene. These contaminants were likewise detected in soils onsite. Targets associated with this zone of actual contamination include Critical habitat for the Federal-listed threatened Puget Sound ESU Chinook salmon, and habitat known to be used by the Federal-listed threatened Puget Sound ESU Steelhead.

Soil Exposure Pathway:
The soil exposure pathway is evaluated based on the threat to residents and nearby populations from soil contamination within the first two feet of the surface.

Exposed contaminated soil is present at the site. A portion of the site is fenced (the north portion that fronts the Washington Narrows). The remainder of the site is paved and covered with buildings.

A total of 14,115 people reside within a 1-mile travel distance of the site (Maguire 2010). Population by distance ring is presented in Table 4. The nearest residence is approximately 0.05 mile from the site. A portion of the site is currently used for commercial and storage purposes. The number of workers present at the site is unknown but assumed to be less than 100. There are no schools or daycares on the site and within 200 feet of an area of exposed contaminated soil. The site is not used for commercial agriculture, silviculture, commercial livestock production, or commercial livestock grazing. There are no Federal- or State-listed threatened or endangered species, or wetlands, present at the site (Maguire 2010).

Air Migration Pathway:
The air migration pathway TDL is a 4-mile radius that extends from sources at the site. The air migration pathway TDL is depicted on Figure 5.

A total of 79,186 people reside within the 4-mile TDL. Additionally, a total of 19 schools with a combined student and teacher population of 24,004 are present within the TDL. Population by distance ring, including student population is presented in Table 4.

The Washington Narrows provides critical habitat for the Federal-listed threatened Puget Sound ESU Chinook salmon. Additionally, the Puget Sound ESU Steelhead is known to be present within Puget Sound. Both of these habitats are within the 4-mile TDL. A total of 221.77 acres of wetlands are present within the TDL. Wetland acreage by distance ring is presented in Table 4.

Washington Narrows, located within ½ mile of the site, is a major or designated water recreation area.

Table 4 Population and Wetland Acreage by Distance Ring

Distance Ring	Residents	Students/ Teachers	Wetland (acreage)
0 – ¼ mile	593	0	0
¼ to ½ mile	2,155	15,145	0
½ to 1 mile	11,367	917	1
1 to 2 miles	23,263	1,623	10.86
2 to 3 miles	17,424	3,692	21.36
3 to 4 miles	24,384	2,627	188.55
TOTAL	**79,186**	**24,004**	**221.77**

Summary and Conclusions:

The site is a former coal gasification plant that operated from the 1930s to 1956 and provided gas to the residents in Bremerton, Washington. The site is in a mixed residential and light industrial area. Based on previous sampling investigations, the site contains soil and ground water contamination at concentrations which exceed their analyte specific screening criteria. Contamination is migrating from the site to surface water targets. A zone of actual contamination is established for the Washington Narrows waterway based on sediment sampling results. Targets associated with this zone of actual contamination include critical habitat for the Federal-listed threatened Puget Sound ESU Chinook salmon and habitat known to be used by the Federal-listed threatened Puget Sound ESU Steelhead.

References

Baum, Rex L., Alan F. Chleborad, and Robert L. Schuster, 1998, *Landslides Triggered by Winter 1996-97 Storms in the Puget Lowland, Washington.*

Ecology and Environment, Inc. (E & E), August 11, 2009, *Bremerton Gasworks Targeted Brownfields Assessment Report*, prepared for United States Environmental Protection Agency, Contract Number EP-S7-06-02, Technical Direction Document number 07-01-0008.

Federal Emergency Management Agency (FEMA), December 18, 2007, *Flood Insurance Rate Map Kitsap County, Washington and Incorporated Areas*, Map Number 53035C0360D.

GeoEngineers, September 20, 2007, *Preliminary Upland Assessment Report, McConkey/Sesko Properties*, Seattle, Washington.

TechLaw, Inc., November 10, 2006a, *Targeted Brownfields Assessment Report, Old Bremerton Gasworks – McConkey Property*, prepared for United States Environmental Protection Agency, Contract Number EP-S7-06-03, Technical Direction Document Number 06-07-0005.

———, November 10, 2006b, *Targeted Brownfields Assessment Report; Old Bremerton Gasworks – Sesko Property*, prepared for United States Environmental Protection Agency, Contract Number EP-S7-06-03, Technical Direction Document Number 06-07-0005.

Turcotte, Carol, October 18, 2010, electronic mail to Renee Nordeen, Ecology and Environment, Inc. project manager regarding commercial treaty and non-treaty fish and shellfish harvest data for Puget Sound.

United States Department of Agriculture (USDA), September 1980, *Soil Survey of Kitsap County Area, Washington*.

United States Department of Commerce (DOC), May 2001, *Profiles of General Demographic Characteristics.*

———, September 2, 2005, *Endangered and Threatened Species; Designation of Critical Habitat for 12 Evolutionarily Significant Units of West Coast Salmon and Steelhead in Washington, Oregon, and Idaho; Final Rule*, National Oceanic and Atmospheric Administration.

United States Environmental Protection Agency, 2009

United States Environmental Protection Agency, 2010, On-Scene Coordiantor web page for the Bremerton MGP Waste Release, http://www.epaosc.org/site/site_profile.aspx?site_id=6425.

Washington State Department of Ecology, March 2009, Facility/Site Search Database, Facility Identification Number 2788449,

https://fortress.wa.gov/ecy/.facilitysitesearch/FSDetailReport.aspx?id-2788449.

———, October 5, 2010, internet search of well logs, http://apps.ecy.gov/welllog/scripts/textresults1.asp

Washington State Department of Fish and Wildlife (WDFW), July 2010, *Washington State Sport Catch Report 2003.*

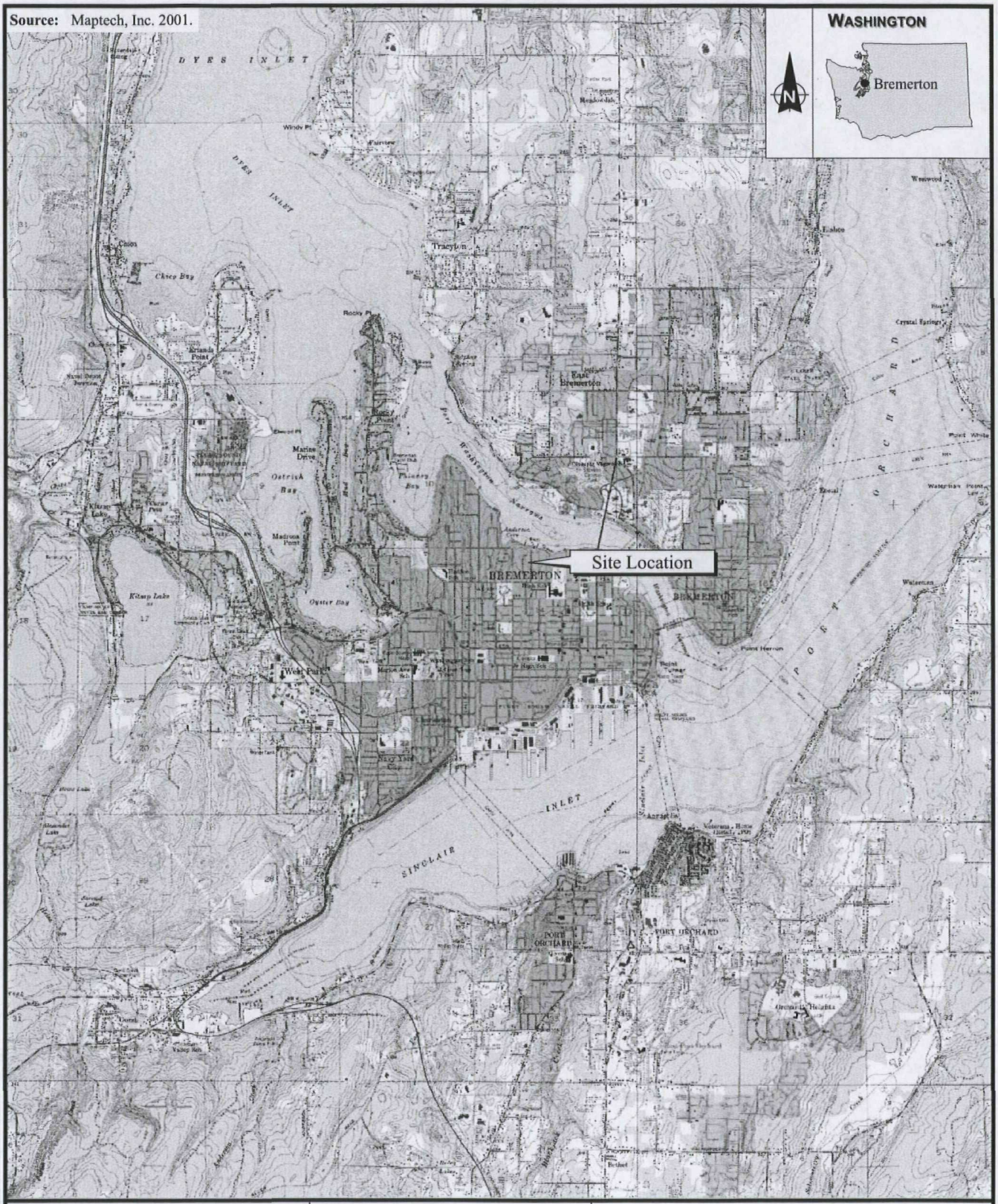
Washington State Department of Health (DOH), October 5, 2010, internet search of Sentry water system, https://fortress.wa.gov/doh/eh/portal/odw/si/SingleSytemViews

Western Regional Climate Control Center (WRCC), October 4, 2010, Period of Record Monthly Climate Summary Bremerton, Washington (450872).

Whitehead, R.L., 1994, *Ground Water Atlas of the United States Idaho, Oregon, Washington.*

Wydoski, Richard S. and Richard R. Whitney, 2003, *Inland Fishes of Washington*, Second Edition, University of Washington Press, Seattle, Washington.

FIGURES



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	BREMERTON GASWORKS TBA Bremerton, Washington	Figure 1 SITE VICINITY MAP		
	0 .5 1 Approximate Scale in Miles	Date: 10-5-10	Drawn by: AES	10:START-3\10080009\fig 1

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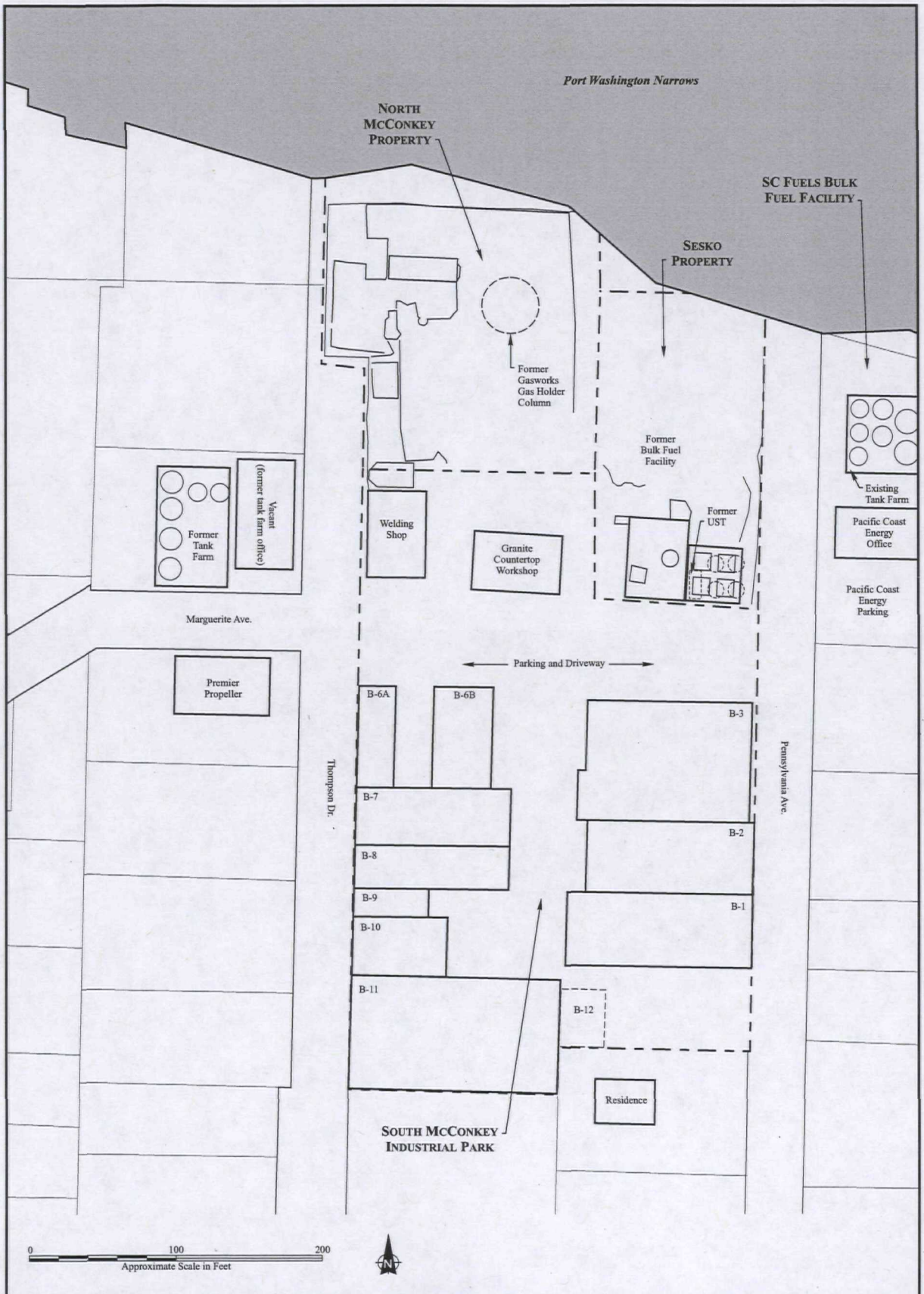

ecology and environment, inc. International Specialists in the Environment Seattle, Washington	BREMERTON GASWORKS TBA Bremerton, Washington	Figure 2 SITE MAP		
	Sources: City of Bremerton 2005, GeoEngineers 2007, and TechLaw, Inc. 2006.	Date: 11/2/10	Drawn by: AES	10:START-3\10080009\fig 2

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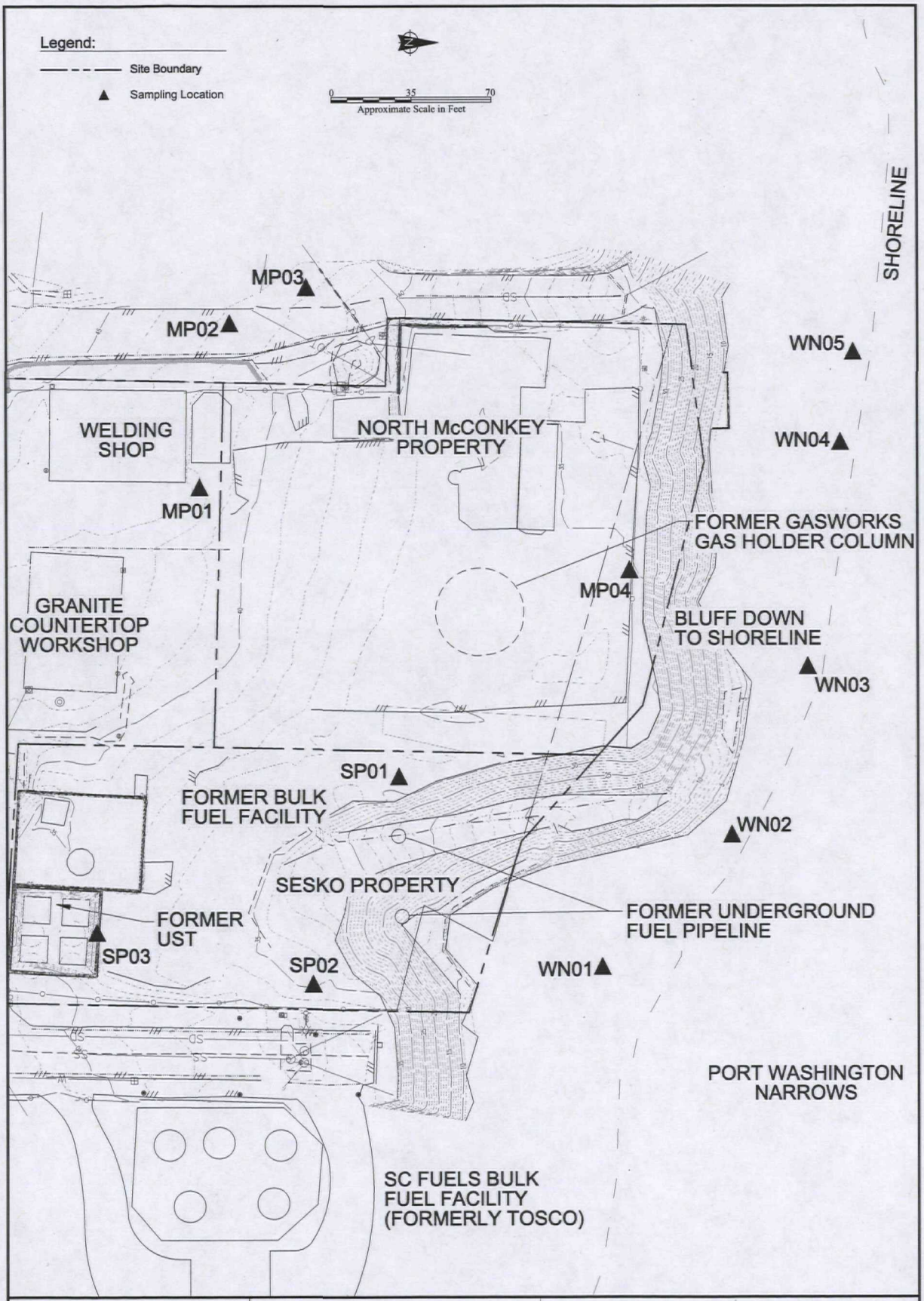

ecology and environment, inc. International Specialists in the Environment Seattle, Washington	BREMERTON GASWORKS TBA Bremerton, Washington	Figure 3 TBA SAMPLE LOCATIONS		
	Base Map Reference: GeoEngineers 2007.	Date: 11/1/10	Drawn by: AES	10:START-3\10080009\fig 3

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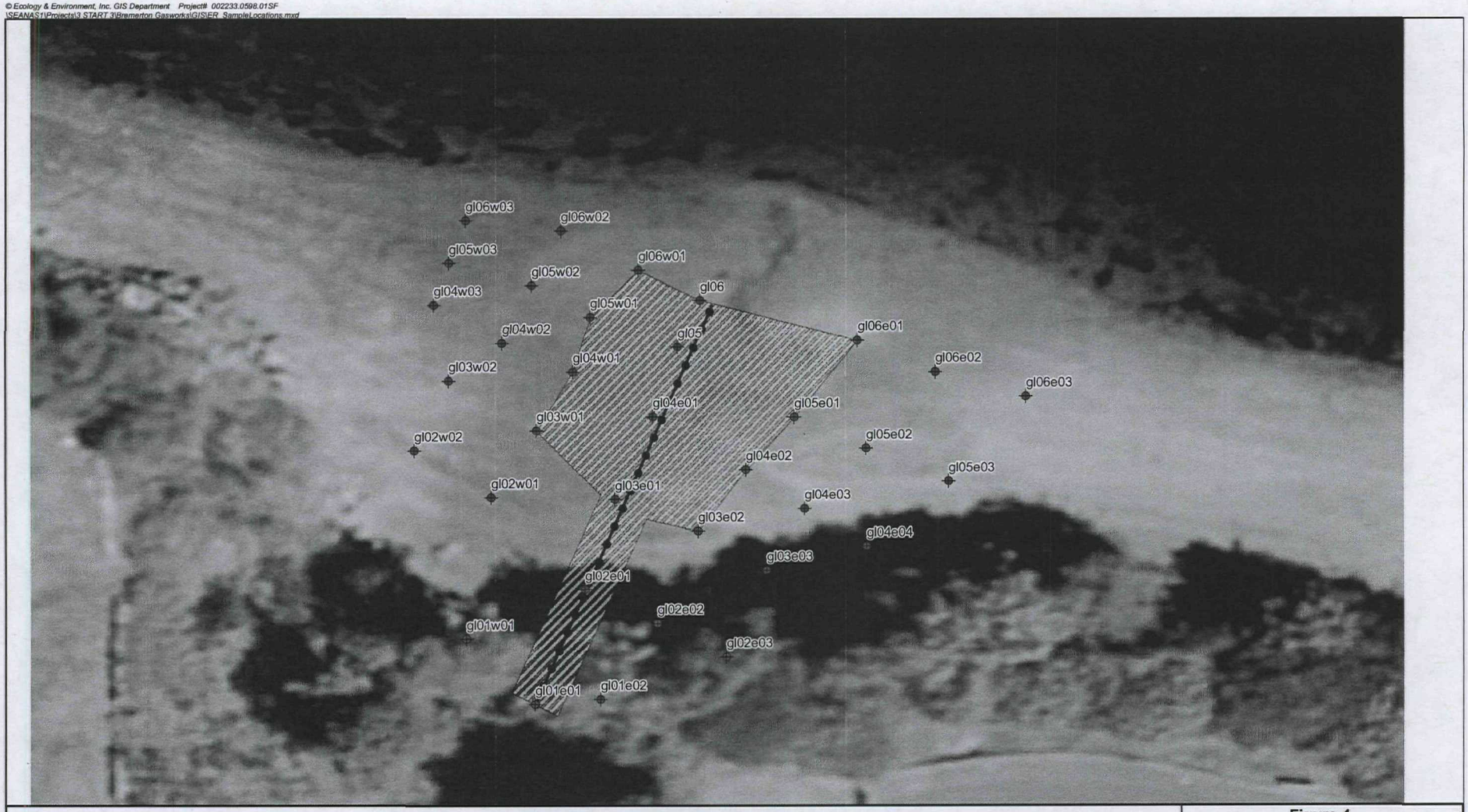

Legend

- Sample Locations
- Pipe Location
- Estimated Excavation Area (~4,000 Sqft)

BREMERTON GASWORKS

PRELIMINARY ASSESSMENT

Figure 4

Emergency Response Sample Locations

0 10 20 40 60
Feet

N

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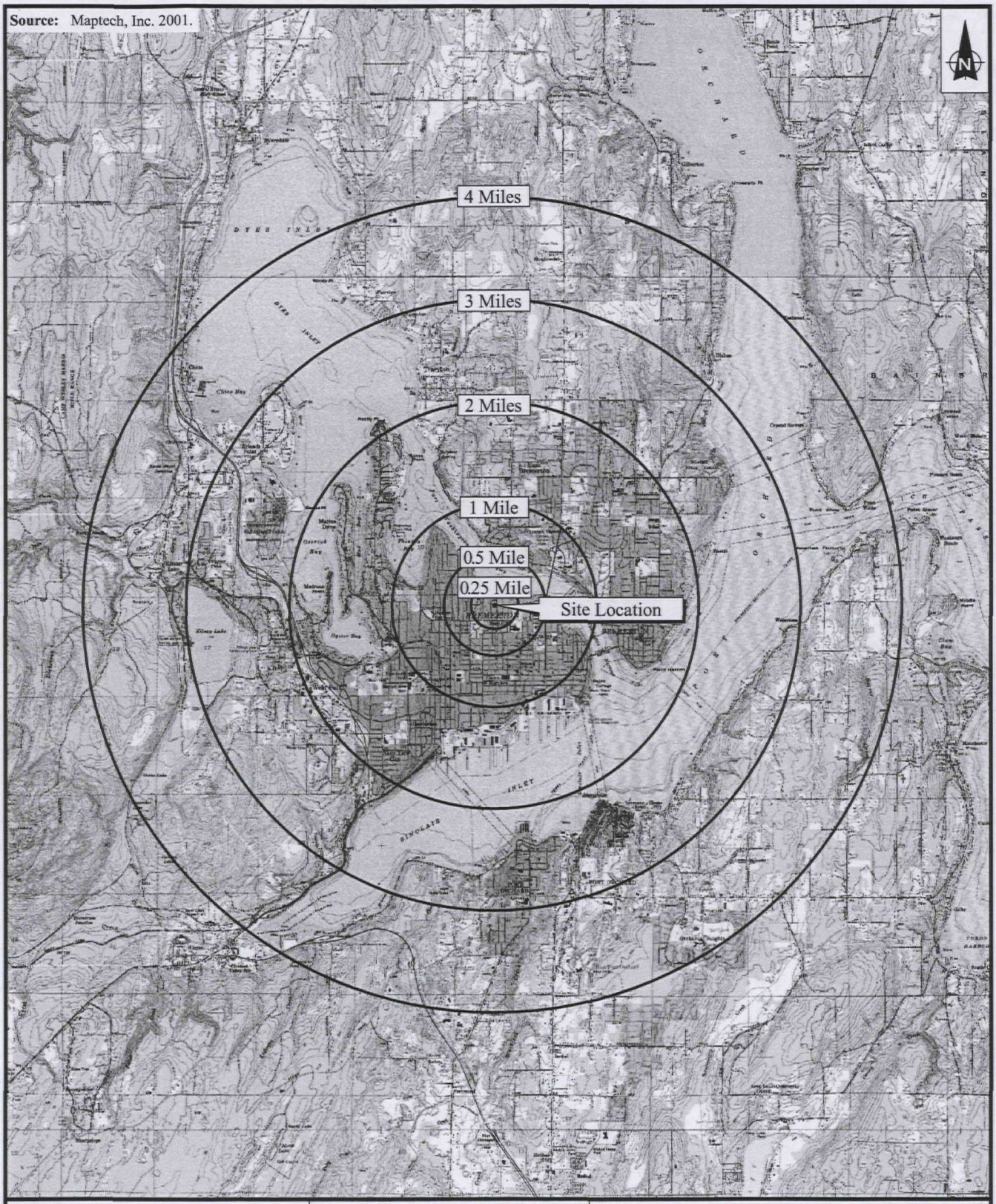

ecology and environment, inc. International Specialists in the Environment Seattle, Washington	BREMERTON GASWORKS TBA Bremerton, Washington	Figure 5 4-MILE MAP		
	0 .5 1 Approximate Scale in Miles	Date: 11-4-10	Drawn by: AES	10:START-3\10080009\fig 5

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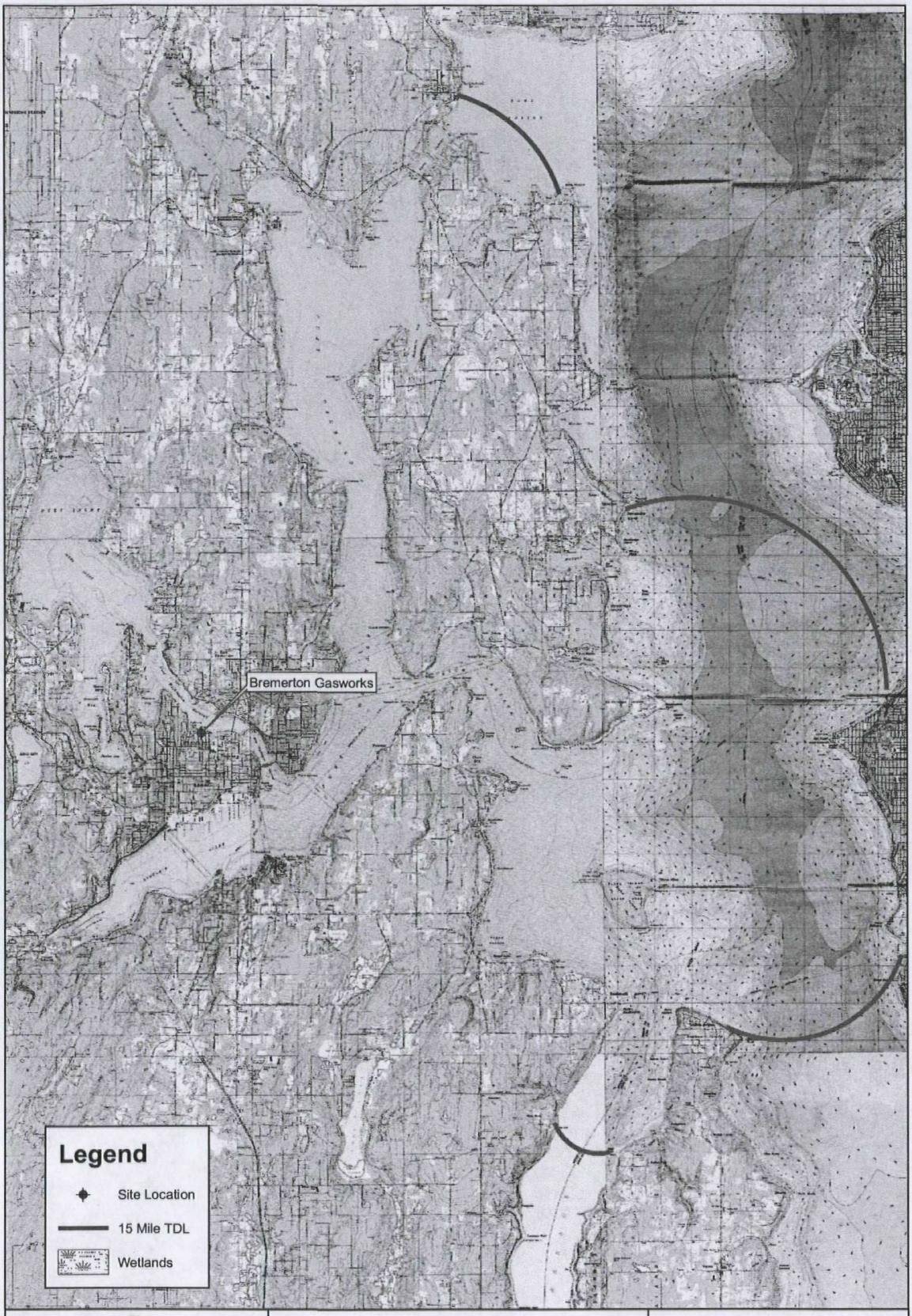

Figure 6

BREMERTON GASWORKS

Bremerton, Washington

15-MILE MAP

TDD Number:
10-08-0009

Map Reference:
USGS Topographical Maps 1:100,000

Date:
September 27, 2010

Drawn by:
amm

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Seattle Washington

..\START3\Bremerton Gasworks\GIS\fig fd1.mxd

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